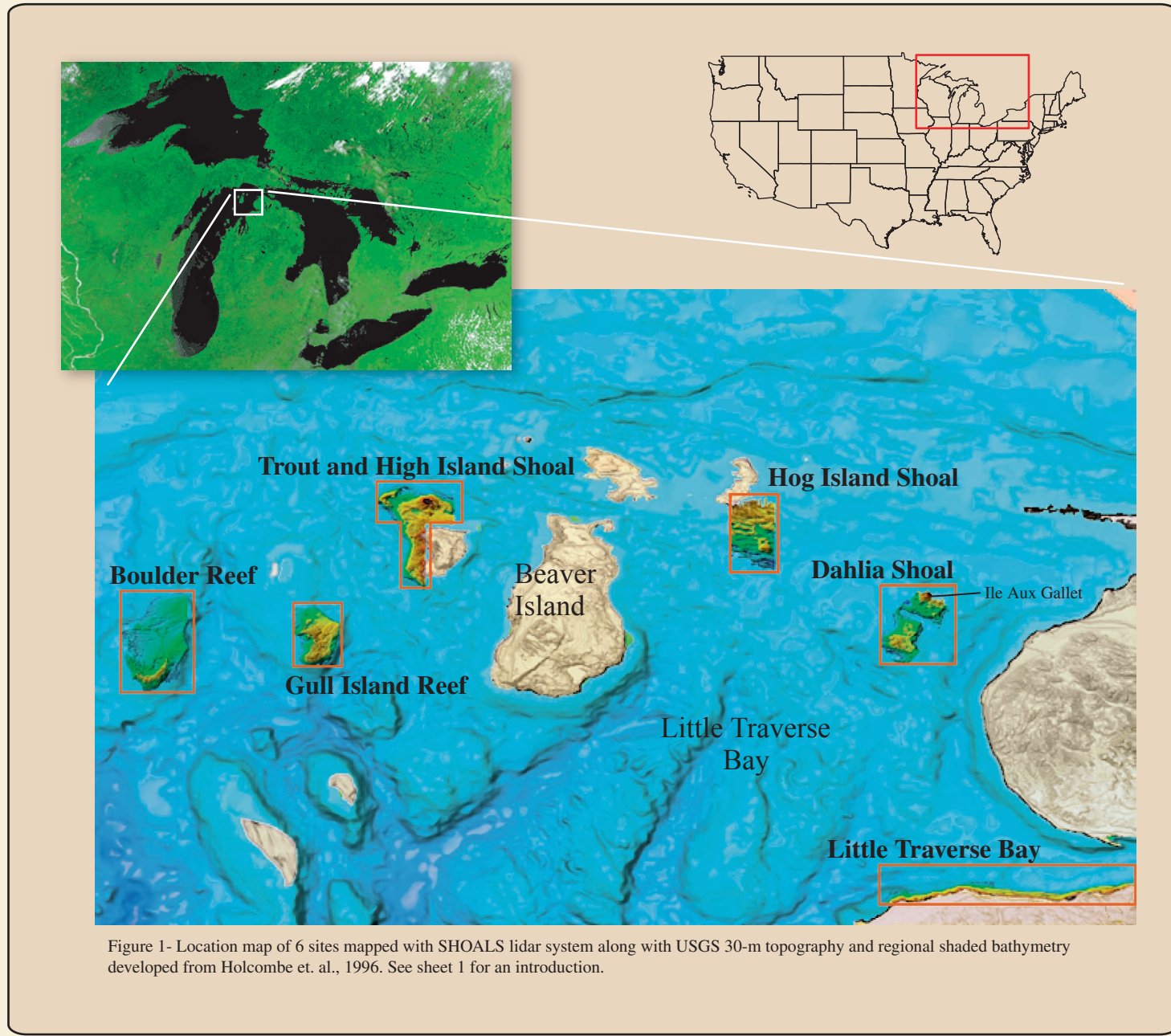




Visualizing the Geology of Lake Trout Spawning Sites: Northern Lake Michigan

By
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2004



Lake floor images generated from SHOALS lidar data below 178.80m (ref. IGLD 85). Data acquired on a four meter grid in August 2001 were collected and processed by J. E. Chance & Associates under contract to the Army Corps of Engineers and the U.S. Geological Survey.

Land imagery created from Digital Orthophoto Quadrangles (DOQ) modified from, http://www.michigan.gov/dnr/0,1607,7-153-10371_14546---,00.html

Data, imagery, and metadata available online at, <http://geopubs.wr.usgs.gov/open-file/of03-120/>. Data collection field activity metadata URL: <http://walrus.wr.usgs.gov/infobank/U/1011m/html/t-1-01-lm.meta.html>. PDF versions of these posters are available at <http://pubs.usgs.gov/imap/f2800>

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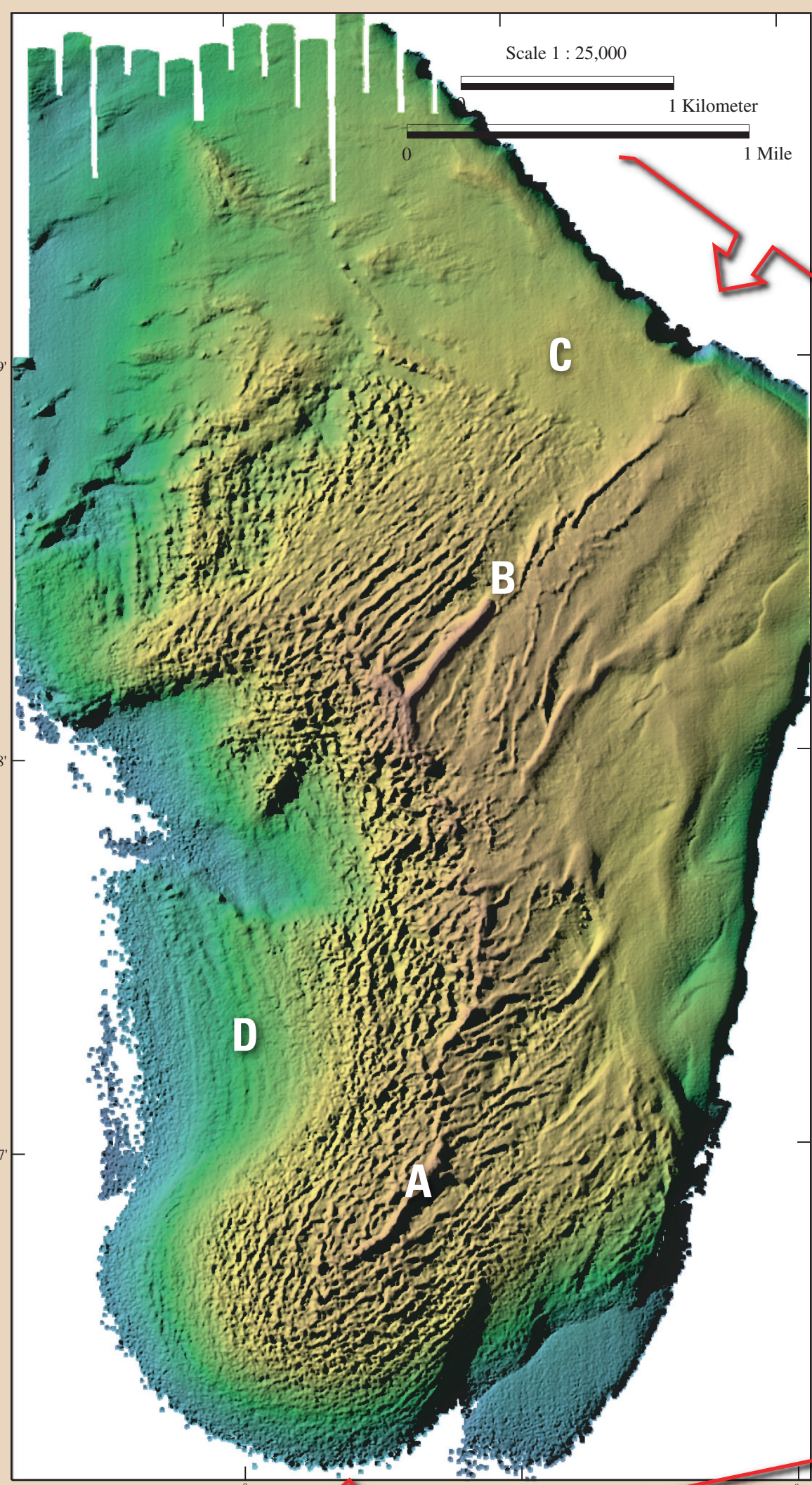


Figure 6.1. Color-coded shaded relief bathymetry of Gull Island Reef. The morphology is similar to that of Boulder Reef (sheet 1, fig. 2.1). Underwater video shows the rough relief is composed of cobble and boulder substrate with less than a meter of local variation (Greg Kennedy, U.S. Geological Survey, Ann Arbor, Michigan, personal commun., 2002). The arcuate shape of the shallow ridge, 3 m depth at (A), suggests derivation from a small lobe of ice moving eastward. This contrasts with the southward ice motion suggested by the morphology at Boulder Reef. Erosional and (or) depositional ridges radiate outward to the northeast from the reef, including a straight, 1-km-long ridge (B). Along the north and east edges of the reef, bottom samples suggest that a smooth, modern sand sheet drapes the rougher substrate (C).

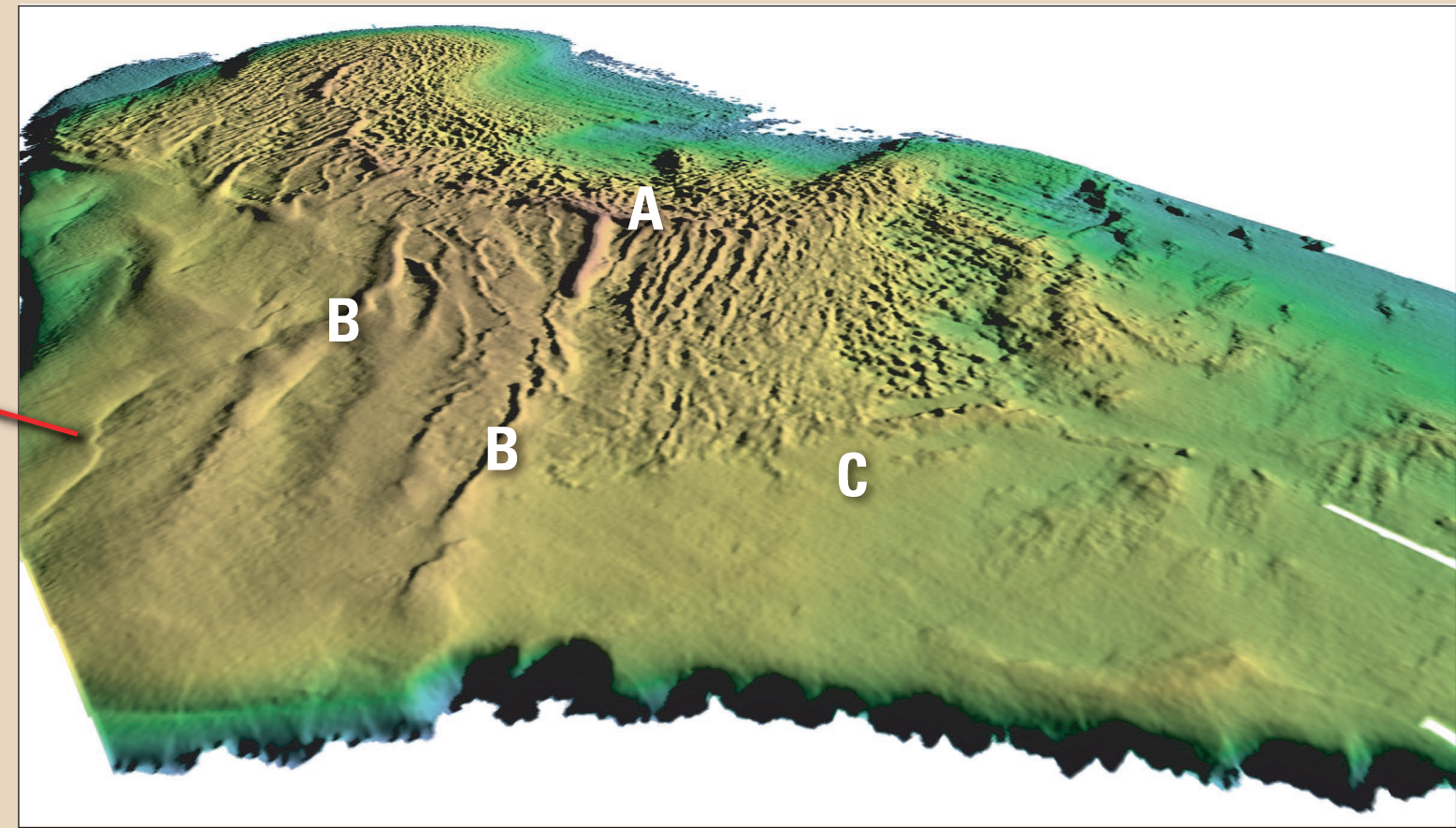


Figure 6.2. Oblique view looking southwest toward Gull Island Reef. The front of the arcuate ridge (A) and radiating parallel ridges (B) of gravel and boulders are emphasized in this view. Also seen is the sand-sheet draping the rough substrate (C). The vertical exaggeration is 4x and the distance across the bottom of the image is about 2.5 km.

GULL ISLAND REEF

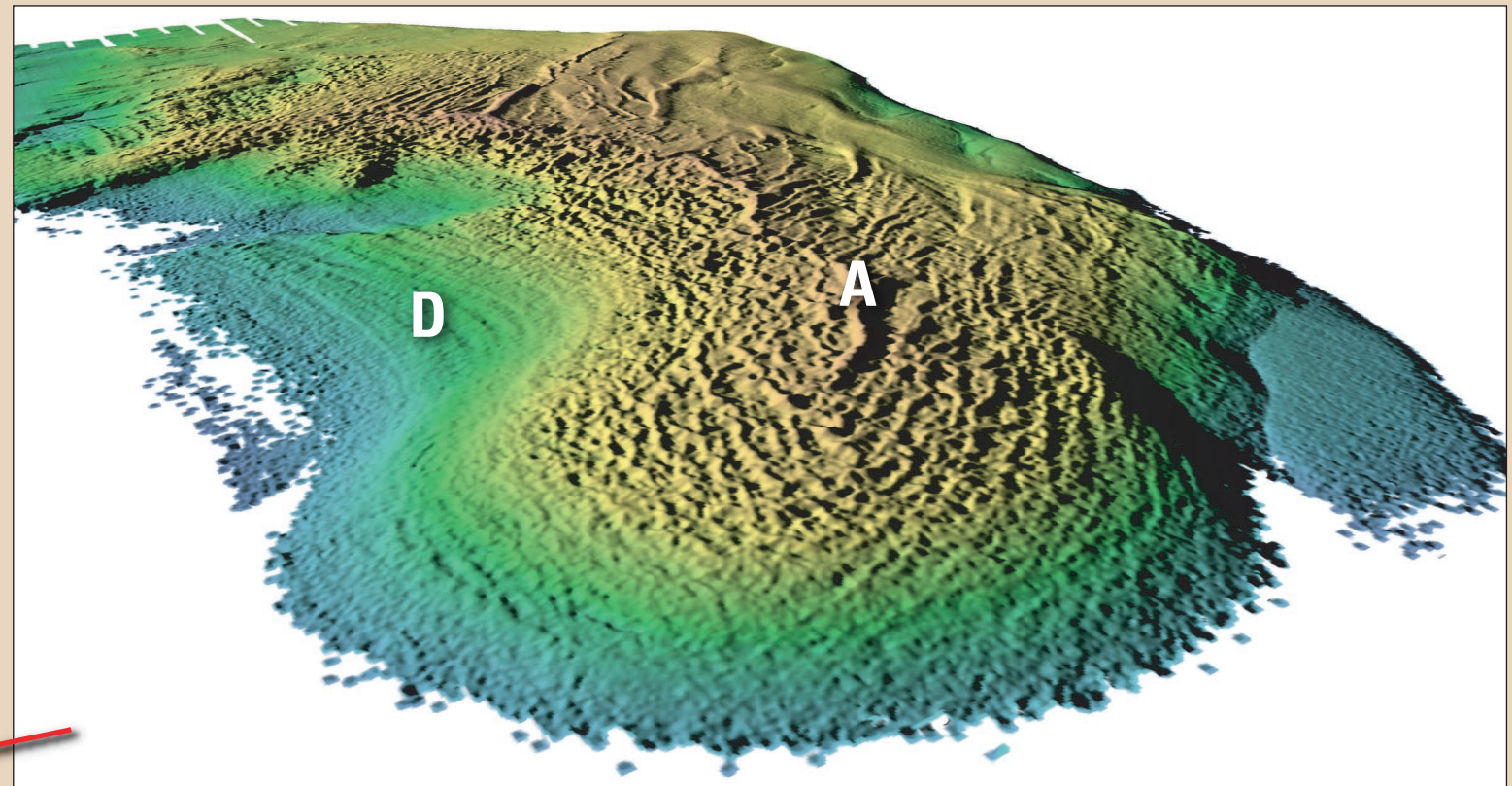


Figure 6.3. Oblique view of Gull Island Reef looking north. The arcuate pattern of the reef (A) is replicated in a step-like fashion into deep water (D). The ridge crest (A) is composed of boulders and cobbles as seen in video data (Guy Fleischer, NOAA, Seattle, Washington, personal commun., 2002). The vertical exaggeration is 4x and the distance across the bottom of the image is about 2.0 km.

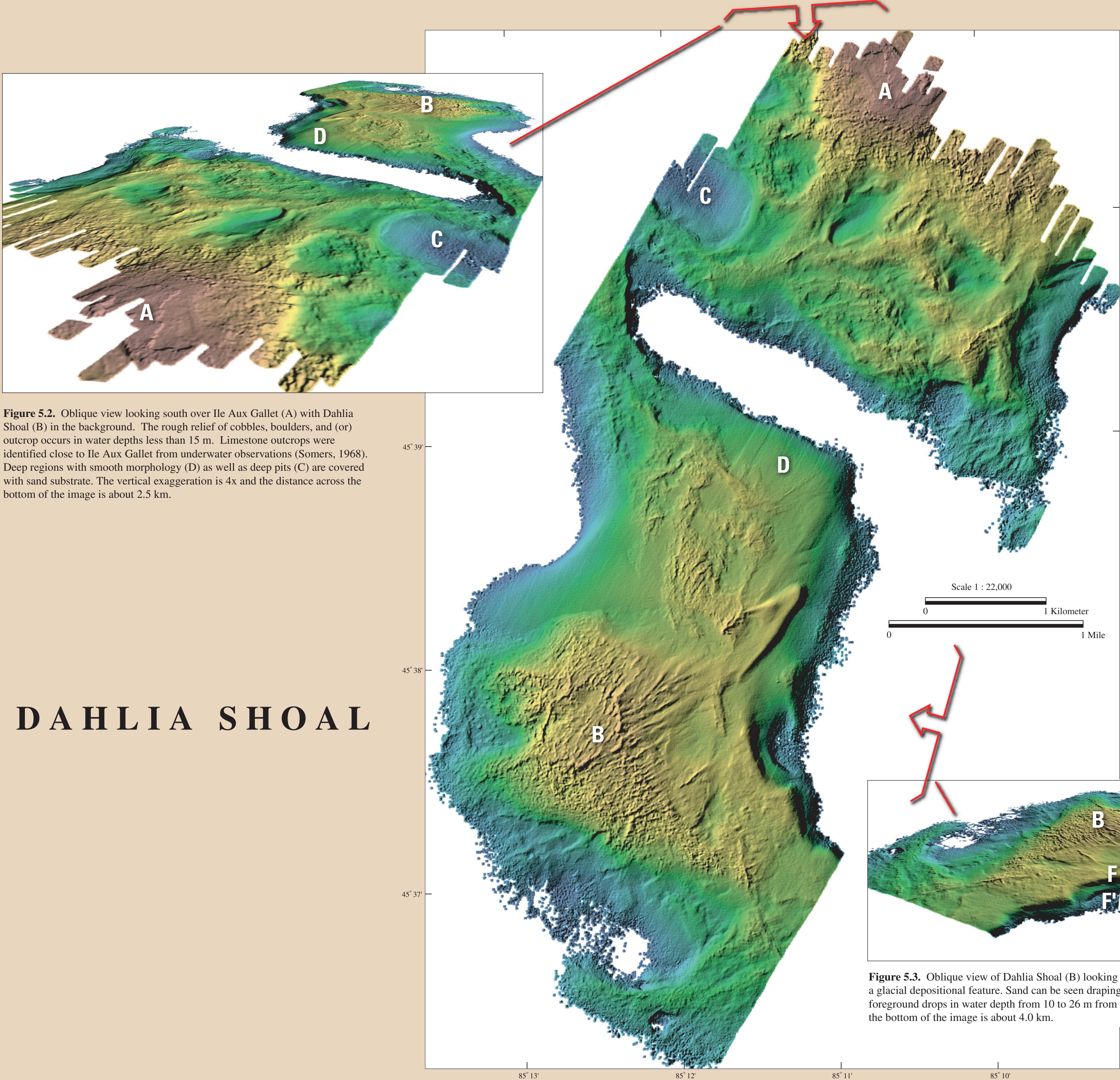
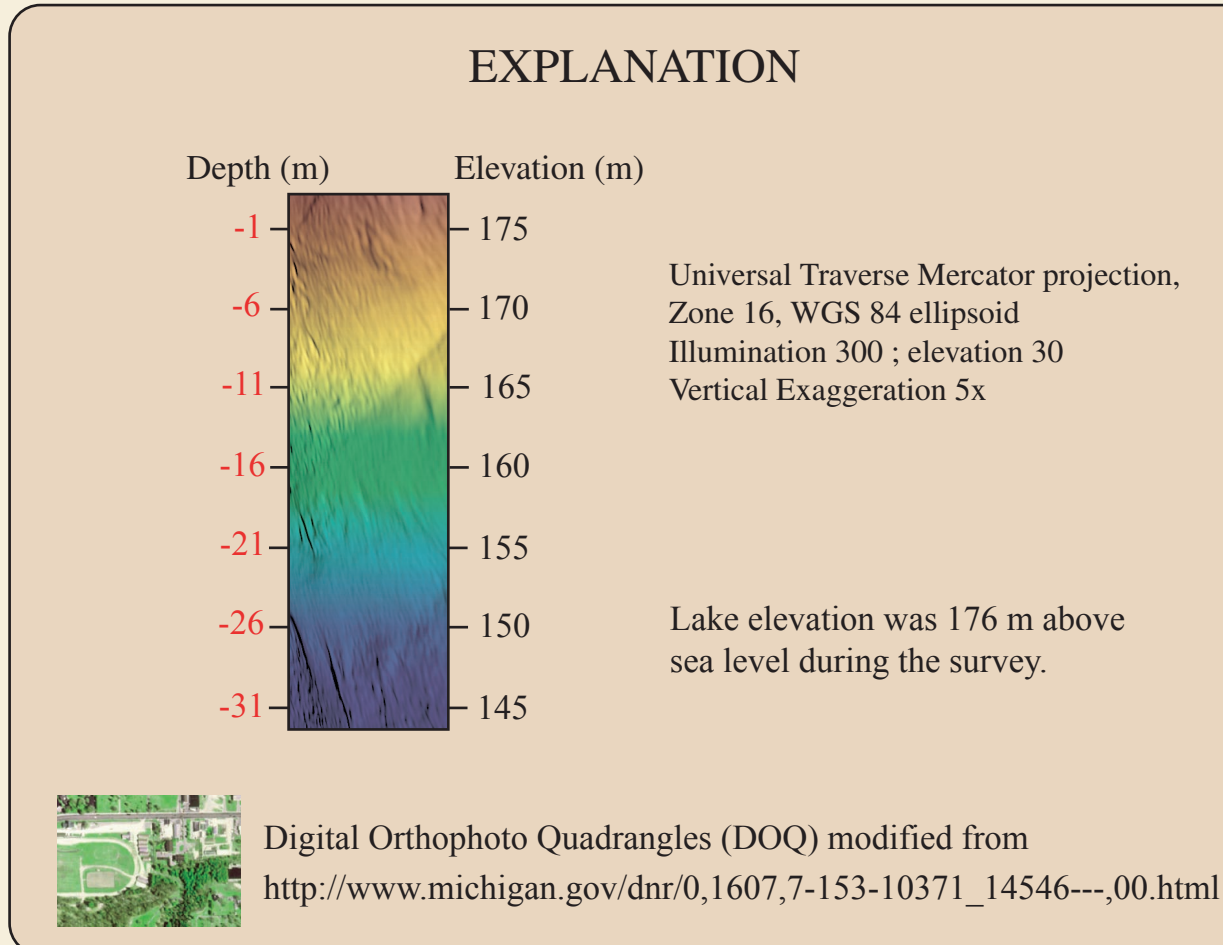


Figure 5.2. Oblique view looking south over Ile Aux Gallet (A) with Dahlia Shoal (B) in the background. The rough relief of cobbles, boulders, and (or) outcrop occurs in water depths less than 15 m. Limestone outcrops were identified close to Ile Aux Gallet from underwater observations (Somers, 1968). Deep regions with smooth morphology (D) as well as deep pits (C) are covered with sand substrate. The vertical exaggeration is 4x and the distance across the bottom of the image is about 2.5 km.

DAHLIA SHOAL

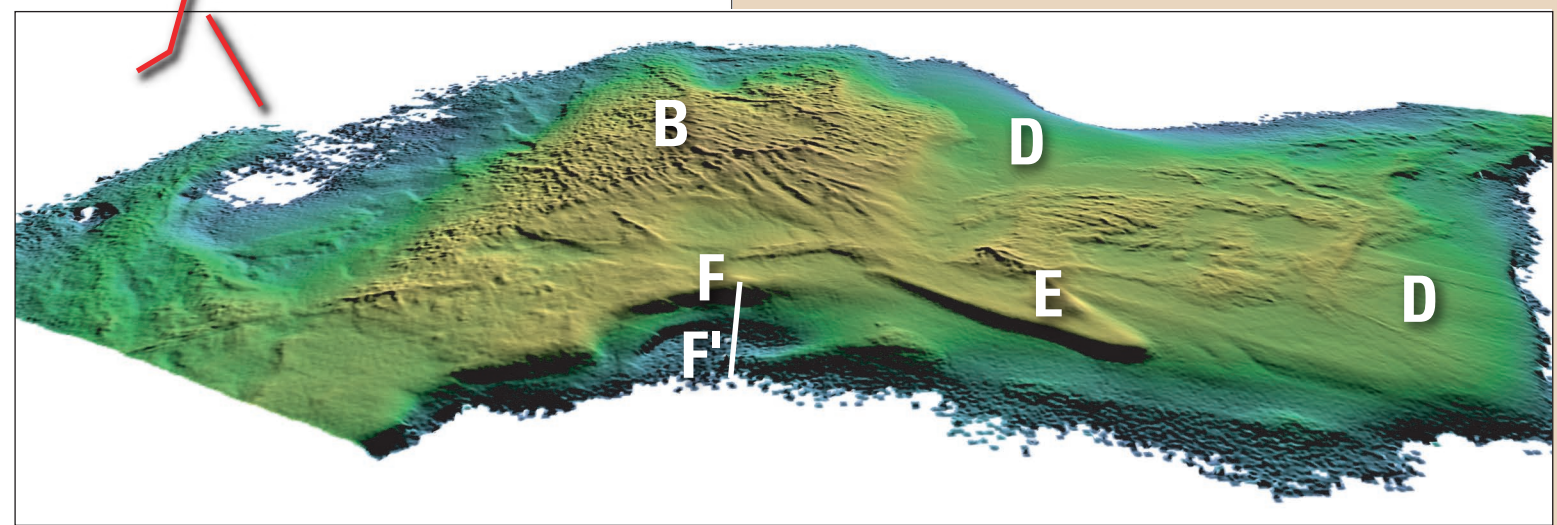


Figure 5.3. Oblique view of Dahlia Shoal (B) looking west. The ridge at (E), which is about 940 m long, is possibly a glacial depositional feature. Sand can be seen draping the rough relief (D) surrounding the shoal. The pit in the foreground drops in water depth from 10 to 26 m from F to F'. The vertical exaggeration is 4x and the distance across the bottom of the image is about 4.0 km.

Figure 5.1. Color-coded shaded relief bathymetry of Ile Aux Gallet (A) and Dahlia Shoal (B). Dahlia Shoal has rough relief, an arcuate ridge, and radiating ridges to the northeast similar to those seen at Gull Island Reef (fig. 6.1). Surrounding Ile Aux Gallet and Dahlia Shoal are numerous pits. The pit at (C) is about 650 m wide northeast to southwest and about 30 m deep at the edge of the survey. Origins of the pits are unknown, but at present the pits appear to be filling with sediment. The center of this region was unmapped because the water depths were too deep to be mapped with the lidar system.

TROUT AND HIGH ISLAND SHOAL



Figure 7.2. Oblique view looking southwest at Trout Island Shoal (A). Three generations of recurved spits (a,b,c), possibly composed of sand, are migrating eastward past the shoal. Northwest-southeast linear ridges at (G) are partly obscured by recent patches of smooth sand. The vertical exaggeration is 4x and the distance across the bottom of the image is about 2.5 km.

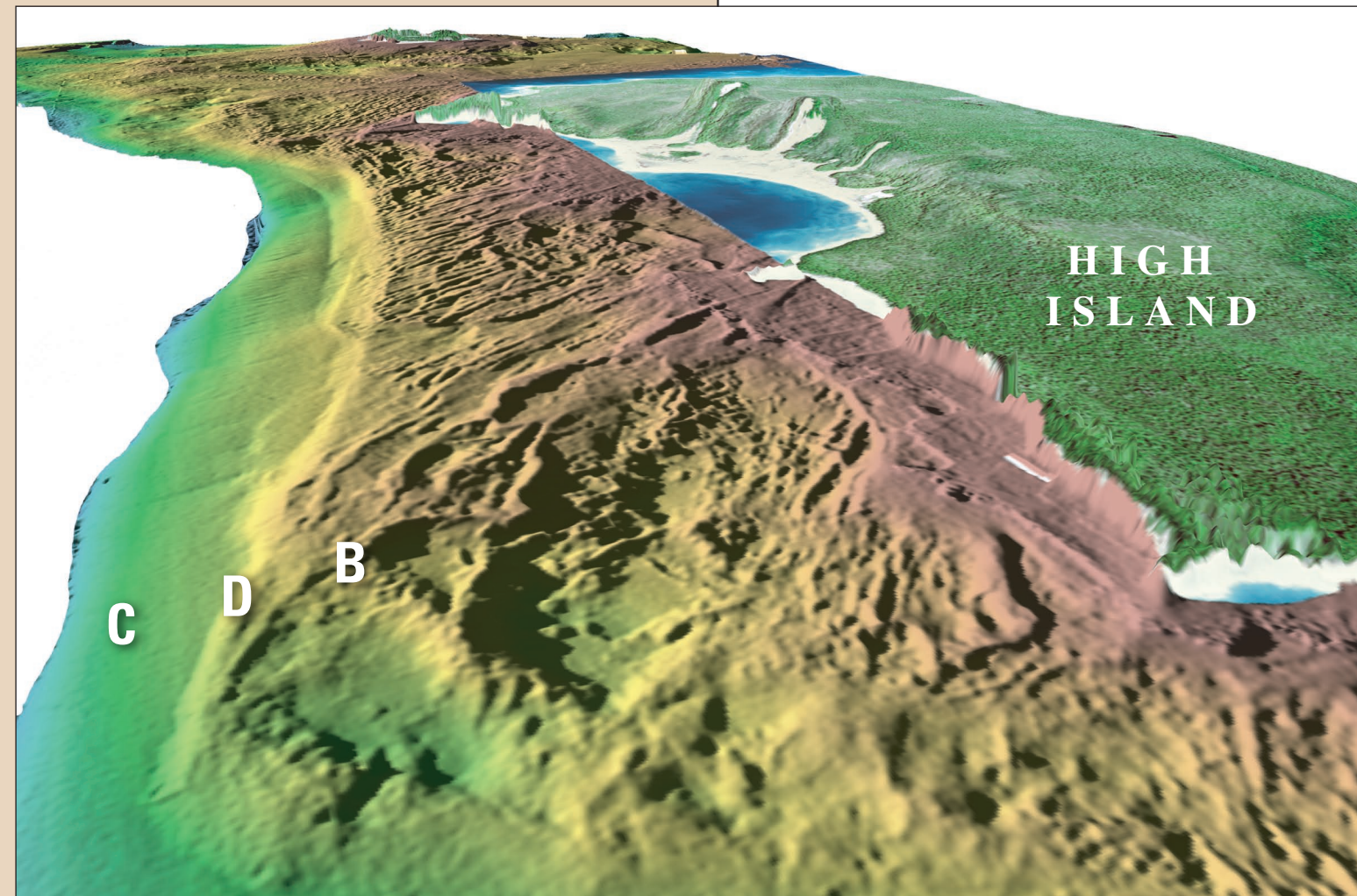


Figure 7.3. Oblique view looking north along the west coast of High Island. The rough morphology nearshore (B), possibly glacial material, is similar in texture and trend to Gull Island Reef (fig. 6.1). This relief abruptly changes to a smooth, possibly sandy bottom (C) along a 2- to 3-m high scarp (D) at about 10 m water depth. The bottom of this scarp may represent the location of a previous glacial shoreline. The vertical exaggeration is 4x and the distance across the bottom of the image is about 1.8 km.

Figure 7.1. Color-coded shaded relief bathymetry of Trout Island Shoal (A), Trout Island area, and west coast of High Island. Similar to the Little Traverse Bay region (sheet 1, fig. 4.1), the rough nearshore relief west of High Island (B) transitions abruptly offshore to a smooth depositional substrate (C) that is possibly composed of sand. The morphology of Trout Island Shoal suggests a large sand shoal migrating eastward over rough glacial deposits. Two or three gouges (D) of unknown origin, possibly ice or manmade, extend east of Trout Island Shoal for over 1 km. Aerial photography shows the nearshore region to a certain depth and shows sand spits extending offshore (E). Expressions of these sand spits can be seen in the lidar data directly offshore (F).

